General

Guideline Title

Evidence-based care guideline for post-operative management of Legg-Calve-Perthes disease in children aged 3 to 12 years.

Bibliographic Source(s)

Cincinnati Children's Hospital Medical Center. Evidence-based care guideline for post-operative management of Legg-Calve-Perthes disease in children aged 3 to 12 years. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2013 Jan. 18 p. [59 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The strength of the recommendation (strongly recommended, recommended, or no recommendation) and the quality of the evidence (1aâ€'5b) are defined at the end of the "Major Recommendations" field.

Inpatient Management Recommendations

1. It is recommended that a thorough history and examination be completed to establish an impairment based physical therapy (PT) diagnosis and individualized plan of care (American Physical Therapy Association [APTA], 2001 [5b]).
2. It is recommended that transfer training and evaluation for medical equipment be performed for the patient referred to inpatient PT post-soft tissue release and application of a Petrie cast (Local Consensus [5]).
   Note: Patient will be discharged from inpatient PT post-soft tissue release and Petrie cast application when patient and family are independent and safe with transfers (Local Consensus [5]).
3. It is recommended that the patient is referred to inpatient PT post-soft tissue release and removal of the Petrie cast, but prior to bony surgery to restore hip, knee, and ankle range of motion (ROM) and to maximize joint mobility to allow for adequate ROM for ease of surgical intervention (Local Consensus [5]).
4. It is recommended that the following are assessed at initial evaluation and at discharge from inpatient PT post soft tissue release and removal of the Petrie cast:
   - Pain using the Oucher Pain Scale (Beyer et al., 2005 [4a]) or Numerical Rating Scale (NRS) (Williamson & Hoggart, 2005 [1b]; von Baeyer et al., 2009 [4b])
   - Qualitative skin integrity assessment (Local Consensus [5])
   - Lower extremity passive range of motion (LE PROM)

   Note 1: LE PROM assessment to include:

- Hip flexion
- Hip extension to no further than 0°
- Hip adduction
- Hip abduction
- Hip internal rotation (IR) with hip flexed to 90°
- Hip external rotation (ER) with hip flexed to 90°
- Knee flexion
- Knee extension
- Ankle dorsiflexion
- Ankle plantarflexion

(Local Consensus [5]).

Note 2: A fluid filled goniometer is to be used to measure ROM (Rao & Joseph, 2001 [4b]). However, use of a linear goniometer is also acceptable (Rao & Joseph, 2001 [4b]; Clapper & Wolf, 1988 [4b]; Local Consensus [5]).

5. It is recommended that the goals for inpatient PT post-soft tissue release and Petrie cast removal but prior to bony surgery include:
   - Hip flexion to 120°
   - Maximize hip abduction, hip IR, and hip ER ROM
   - Hip extension to no further than 0°
   - Knee flexion to 120°
   - Maximize ankle plantarflexion and dorsiflexion
   - Maximize integrity of the skin
   - Minimize pain

   (Local Consensus [5]).

6. It is recommended that the following treatment interventions be utilized for impairments found during initial assessment:
   - Pain management
     - Warm whirlpool (Local Consensus [5]), cryotherapy, or hot pack based on patient preference (Nadler, Weingand, & Kruse, 2004 [5a])
     - Gentle PROM (Local Consensus [5])
   - Improving ROM
     - Gentle passive static stretching for LE musculature (Moseley et al., 2005 [2a]; Bandy, Irion, & Briggler, 1998 [2a]; Davis et al., 2005 [2b])
     - Warm whirlpool (Local Consensus [5]) or hot pack for muscle relaxation and pain management with stretching (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a])
     - Perform active range of motion (AROM) and active assistive range of motion (AAROM) following passive stretching to maintain newly gained ROM (Depino, Webright, & Arnold, 2000 [2b])
   - Improving skin integrity
     - A warm whirlpool may be utilized to promote improved skin integrity (Local Consensus [5]).

7. It is recommended that patients are discharged from inpatient PT post-soft tissue release and removal of the bony cast when the bony surgical procedure is performed (Local Consensus [5]).
   Note: Transfer training and evaluation for medical equipment following the bony surgery and application of the hip spica cast may be completed if needed (Local Consensus [5]).

Outpatient Management Recommendations

Clinical Assessment

8. It is recommended that patients begin post-operative PT following bony surgery one week after removal of the cast (Local Consensus [5]).
   Note: Individuals who participate in supervised clinic visits demonstrate greater improvement in muscle strength, functional mobility, gait speed, and quality of exercise performance than those who receive a home exercise program (HEP) alone or no instruction at all (Friedrich, Cermak, & Maderbacher, 1996 [2b]). Individuals who receive regular positive feedback from PT are more likely to be compliant with a supplemental HEP (Sluijs, Kok, & van der Zee, 1993 [4b]).

9. It is recommended that a second thorough history and examination be completed to establish an outpatient impairment based PT diagnosis and individualized plan of care (APTA, 2001 [5b]).

Note: Obtaining a pertinent history includes communication with the referring physician regarding the surgical procedure, associated precautions, and physician preferences (Local Consensus [5]).

10. It is recommended that the following are assessed at the initial evaluation, on a monthly basis or more frequently if the patient demonstrates a change in status, and at discharge:
    - Pain and symptoms
    - LE PROM and AAROM and/or AROM
    - LE strength
    - Gait
    - Balance
    - Patient reported outcome measures

    (Local Consensus [5]).

Pain and Symptoms

11. It is recommended that pain is assessed at each visit using the Oucher Pain Scale (Beyer et al., 2005 [4a]) or NRS (Williamson & Hoggart, 2005 [1b]; von Baeyer et al., 2009 [4b]).

Lower Extremity PROM and AROM

12. It is recommended that a fluid filled goniometer be used to measure ROM (Rao & Joseph, 2001 [4b]).
    Note 1: Hip ROM to assess includes hip flexion, abduction, extension, IR, and ER.

    Note 2: Use of a linear goniometer is also acceptable (Rao & Joseph, 2001 [4b]; Clapper & Wolf, 1988 [4b]; Local Consensus [5]).

13. It is recommended that knee and ankle ROM be assessed at the initial evaluation and thereafter, as needed based on limitations (Local Consensus [5]).

Lower Extremity Strength

14. It is recommended that quantitative muscle testing is performed using a hand held dynamometer (Gajdosik, 2005 [4b]; Escolar et al., 2001 [4b]).
    Note 1: Muscle groups to assess include hip flexors, hip abductors, hip extensors, hip internal rotators, hip external rotators, knee extensors, knee flexors, and any other muscle group that is significantly limited (Local Consensus [5]).

    Note 2: The hand held dynamometer has been found to have high intra- and inter-rater reliability with quantitative muscle testing (Gajdosik, 2005 [4b]; Escolar et al., 2001 [4b]).

Gait/Functional Mobility

15. It is recommended that functional mobility and gait be qualitatively assessed following post-operative weight bearing (WB) precautions (Local Consensus [5]).
    Note 1: Commonly observed gait characteristics seen in children with Legg-Calve-Perthes (LCP) when WB on the involved LE include, but are not limited to:

    - Increased hip adduction on stance leg (Westhoff et al., 2006 [4b])
    - Trunk lean outside the normal range (Westhoff et al., 2006 [4b])
    - Trendelenburg (Westhoff et al., 2006 [4b]) (hip drop on unaffected limb while in swing)
    - Compensated Trendelenburg/reverse Trendelenburg/Duchenne (Westhoff et al., 2006 [4b]) (trunk lean to the affected side while in stance on the affected limb)
    - Toe in or toe out (Yoo et al., 2008 [4b])
    - Decreased hip extension during stance (Westhoff et al., 2012 [4b])

    Note 2: Commonly observed gait characteristics seen in children following removal of a hip spica cast include, but are not limited to:

    - Increased dorsiflexion
    - Increased hip and knee flexion
    - Compensated Trendelenburg

    (Wong et al., 2004 [2b]).

16. It recommended that the gold standard for gait analysis of 3-D kinematics and kinetics (Toro, Nester, & Farren, 2003 [1b]) not be used in the clinic due to limited accessibility and feasibility (Local Consensus [5]).
    Note: There is insufficient evidence and lack of reliability and validity (Toro, Nester, & Farren, 2003 [1b]) to support use of these observational gait assessment tools with this population (Local Consensus [5]).

Balance

17. It is recommended that balance is assessed in patients 7 years old or older using the Pediatric Balance Scale (Franjoine et al., 2010 [4b]) as WB status allows (Local Consensus [5]).
    Note: Balance is assessed using single leg (SL) stance on the involved side compared to the uninvolved side if:
    - The patient is younger than 7 years old
    - The patient is unable to follow commands
    - The test is unavailable
    - Time does not permit its use

    (Local Consensus [5]).

Outcome Measure Scores

18. It is recommended that the age appropriate Pediatric Quality of Life Inventory Version 4.0 (PedsQL) (Varni, Seid, & Kurtin, 2001 [4a]) Physical Functioning section is administered at the initial evaluation, on a monthly basis, and at discharge for reassessment of patient's reported functional status (Local Consensus [5]).
    Note 1: The Parent Report for Toddlers is administered for children 2 to 4 years old (Varni, Limbers, & Burwinkle, "How young can children", 2007 [4a]).

    Note 2: The Young Child Self Report is administered for children 5 to 7 years old (Varni, Limbers, & Burwinkle, "How young can children", 2007 [4a]).

    Note 3: The Child Self Report is administered for children 8 to12 years old (Varni, Limbers, & Burwinkle, "How young can children", 2007 [4a]).

    Note 4: For patients 5 to 12 years old unable to conceptually understand the questionnaire tool, it is acceptable for the parent to complete the parent proxy form for the young child (5 to 7 years old) or child (8 to 12 years old) (Varni, Limbers, & Burwinkle, "Parent proxy-report", 2007 [4a]).

Physical Therapy Interventions

19. It is recommended that supervised PT is supplemented with a customized written HEP (Friedrich, Cermak, Maderbacher, 1996 [2b]) in all phases of rehabilitation (Local Consensus [5]).
20. It is recommended that the PT engage in ongoing communication with the patient, family, and referring physician regarding the disease process and plan of care (Local Consensus [5]).
21. It is recommended that advancement through the phases of rehabilitation follow both a goal based and time based progression, due to the nature of the surgical procedure and disease process (Local Consensus [5]).
    Note: Treatment is to focus on containment of the femoral head in the acetabulum throughout the disease process (Wenger, Ward, & Herring, 1991 [5a]; Leach, 2006 [5b]) and each phase of rehabilitation (Local Consensus [5]).

Phases Of Rehabilitation

Initial Phase (0 to 2 weeks post-cast removal)

22. It is recommended that goals of the Initial Phase include:
    - Minimize pain
    - Optimize ROM of hip, knee, and ankle
    - Increase strength to 3/5 or greater for hip flexion, abduction, and extension
    - Increase strength to 3+/5 or greater for the knee and ankle
    - Increase independence with functional mobility using appropriate assistive devices and maintaining WB status

    (Local Consensus [5]).

23. It is recommended that supervised PT services are provided weekly (Bailes, Reder, & Burch, 2008 [5a]) at a frequency of 2 to 3 times per

week (Local Consensus [5]).

24. It is recommended that treatment interventions of the Initial Phase used to address these specific goals include:
    - Minimizing pain
        - Hot pack for relaxation and pain management with stretching (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a])
        - Cryotherapy (Nadler, Weingand, & Kruse, 2004 [5a])
        - Medications for pain as prescribed by the referring physician (Local Consensus [5])
    - Increasing ROM (See Appendix 1 in the original guideline document for exercise prescription)
        - Passive static stretch (Moseley et al., 2005 [2a]; Bandy, Irion, & Briggler, 1998 [2a]; Davis et al., 2005 [2b]) for LE musculature.
          Note: A hot pack may be used with passive static stretching based on patient preference and comfort (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a]).
        - Dynamic ROM (Bandy, Irion, & Briggler, 1998 [2a]) and AAROM as appropriate if the patient is muscle guarding due to pain and/or is unable to achieve end ROM with passive static stretch (Local Consensus [5])
        - Perform AROM and AAROM following passive stretching to maintain newly gained ROM (Depino, Webright, & Arnold, 2000 [2b])
        - Perform stretching in a position that is suitable for the individual including hip IR, hip ER, hip abduction, and hip extension (Local Consensus [5])
    - Increasing strength (See Appendix 2 in the original guideline document for exercise prescription)
        - Begin with isometric exercises at the hip and progress to isotonic exercises in a gravity lessened position (Brech & Guarnieiro, 2006 [3b])
        - Begin with isometric exercises at the knee and ankle, progressing to isotonic exercises in a gravity lessened position with further progression to isotonic exercises against gravity (Brech & Guarnieiro, 2006 [3b])
        - Begin with 2 sets of 10 to 15 repetitions of each exercise (Rhea et al., 2002 [2b]; Faigenbaum et al., 1996 [4b]) with progression to 3 sets of each exercise to be used (Rhea et al., 2002 [2b])
          Note: If the patient is unable to perform 2 sets of 10 repetitions of an exercise, decrease the difficulty of the exercise through weight or type of exercise (Local Consensus [5]).
        - Focus on strengthening of hip abductors, hip flexors, hip ER, hip IR, hip extensors, or other LE muscle group that displays weakness (Local Consensus [5])
    - Improving skin integrity
        - Scar massage and desensitization to minimize adhesions (Local Consensus [5])
        - Warm bath to improve skin integrity following cast removal, if feasible in the home environment (Local Consensus [5])
        - Warm whirlpool may be utilized if the patient is unable to safely utilize a warm bath for skin integrity management (Local Consensus [5])
    - Improving gait and functional mobility
        - Follow the referring physician's guidelines for WB status (Local Consensus [5])
        - Transfer training and bed mobility to maximize independence with activities of daily living (ADL's) (Local Consensus [5])
        - Gait training with the appropriate assistive device, focusing on safety and independence (Local Consensus [5]).

Intermediate Phase (2 to 6 weeks post-cast removal)

25. It is recommended that goals of the Intermediate Phase include:
    - Minimize pain
    - Normalize ROM of the knee and ankle
    - Optimize ROM of hip in all directions
    - Increase strength of the knee and hip, except for hip abductors, to at least 60% of the uninvolved LE
    - Increase strength of the hip abductors to at least 50% of the uninvolved LE due to mechanical disadvantage (Joo et al., 2008 [4b]; Salter, 1984 [5a])
    - Maintain independence with functional mobility maintaining WB status and use of appropriate assistive devices

    (Local Consensus [5]).

26. It is recommended that supervised PT services are provided weekly (Bailes, Reder, & Burch, 2008 [5a]) at a frequency of 2 times per week (Local Consensus [5]).
27. It is recommended that treatment interventions of the Intermediate Phase used to address these specific goals include:

- Minimizing Pain
  - Hot pack for relaxation and pain management with stretching (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a])
  - Cryotherapy (Nadler, Weingand, & Kruse, 2004 [5a])
  - Medications for pain as prescribed by the referring physician (Local Consensus [5])
- Increasing ROM (See Appendix 1 in the original guideline document for exercise prescription)
  - Passive static stretch (Moseley et al., 2005 [2a]; Bandy, Irion, & Briggler, 1998 [2a]; Davis et al., 2005 [2b]) for LE musculature
    Note: A hot pack may be used with passive static stretching based on patient preference and comfort (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a]).
  - Dynamic ROM (Bandy, Irion, & Briggler, 1998 [2a]) and AAROM may be appropriate if the patient is muscle guarding due to pain and unable to achieve end ROM with passive static stretch (Local Consensus [5])
  - Perform AROM and AAROM following passive stretching to maintain newly gained ROM (Depino, Webright, & Arnold, 2000 [2b])
  - Perform stretching in a position that is suitable for the individual and include hip IR, hip ER, hip abduction, hip extension (Local Consensus [5])
  - Perform stretching of the knee and ankle as needed based on remaining limitations (Local Consensus [5])
- Increasing strength (See Appendix 2 in the original guideline document for exercise prescription)
  - Isotonic exercises of the hip in gravity lessened positions and advancing to against gravity positions (Brech & Guarnieiro, 2006 [3b])
  - Isotonic exercises of the knee and ankle in gravity lessened and against gravity positions (Brech & Guarnieiro, 2006 [3b])
  - Begin closed chain double limb (DL) exercises with very light resistance (less than 50% body weight on involved LE) (Bolgla & Uhl, 2005 [4b]) if WB status allows
- Improving skin integrity
  - Continue with scar massage and desensitization (Local Consensus [5])
- Improving gait and functional mobility
  - Follow the referring physician's guidelines for WB status (Local Consensus [5])
  - Continue gait training with the appropriate assistive device focusing on safety and independence (Local Consensus [5])
  - Begin slow walking in chest deep pool water with arms submerged (Roesler et al., 2006 [4b]; Harrison, Hillman, & Bulstrode, 1992 [4b]).

28. It is recommended that activities outside of PT are restricted at this time due to WB status. If the referring physician allows, swimming is permitted (Local Consensus [5]).

Advanced Phase (6 to 12 weeks post-cast removal)

29. It is recommended that the goals of the Advanced Phase include:
    - Minimize pain
    - Optimize ROM and flexibility of the hip, knee, and ankle
    - Increase strength of the knee and hip, except for hip abductors, to at least 70% of the uninvolved LE
    - Increase strength of the hip abductors to at least 60% of the uninvolved LE due to mechanical disadvantage (Joo et al., 2008 [4b]; Salter, 1984 [5a])
    - Ambulation without use of an assistive device or pain
    - Negotiate stairs independently using step to pattern with upper extremity (UE) support
    - Improve balance to greater than 69% of the maximum Pediatric Balance Score (39/56) or SL stance of the uninvolved side

    (Local Consensus [5]).

30. It is recommended that supervised PT services are provided weekly (Bailes, Reder, & Burch, 2008 [5a]) at a frequency of 1 to 2 times per week (Local Consensus [5]).
31. It is recommended that treatment interventions of the Advanced Phase used to address these specific goals include:
    - Minimizing pain
      - Hot pack for relaxation and pain management with stretching (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a])
      - Cryotherapy (Nadler, Weigand, & Kruse, 2004 [5a])
      - Medications for pain as prescribed by the referring physician (Local Consensus [5])

- Increasing ROM (See Appendix 1 in the original guideline document for exercise prescription)
  - Static stretch (Moseley et al., 2005 [2a]; Bandy, Irion, & Briggler, 1998 [2a]; Davis et al., 2005 [2b]) for LE musculature focusing on the hamstrings, quadriceps, hip flexors, gastrocnemius, hip adductors, and hip rotators to maintain containment of the femoral head and allow for normalized gait (Local Consensus [5])
  - Dynamic ROM (Bandy, Irion, & Briggler, 1998 [2a]) and AAROM may be appropriate if the patient is muscle guarding due to pain and unable to achieve end ROM with passive static stretch (Local Consensus [5])
  - Perform AROM and AAROM following passive stretching to maintain newly gained ROM (Depino, Webright, & Arnold, 2000 [2b])
- Increasing strength (See Appendix 2 in the original guideline document for exercise prescription)
  - Isotonic exercises of the hip, knee, and ankle in gravity lessened and against gravity positions, including concentric and eccentric contractions (Brech & Guarnieiro, 2006 [3b])
  - WB and non-weight bearing (NWB) activities can be used in combination based on the patient's ability (Jacobs et al., 2009 [4b]) and goals of the treatment session (Local Consensus [5])
  - Begin UE supported functional dynamic SL activities (e.g. step ups, side steps) (Local Consensus [5])
  - Continue with DL closed chain exercises with resistance, progressing to SL closed chain exercises with light resistance if WB status allows (Local Consensus [5])
  - Use of a stationary bike in an upright or recumbent position keeping the hip in less than 90 degrees of flexion (Local Consensus [5])
- Improving balance
  - Begin with activities that include DL stance on stable surfaces with a narrowed base of support, progressing to perturbations (Local Consensus [5])
  - Progress to DL stance on unstable surfaces with a wide base of support, progressing to perturbations (Local Consensus [5])
- Improving gait and functional mobility
  - Gait training WB as tolerated (WBAT) with an appropriate assistive device when the referring physician allows, focusing on minimizing deficits (Local Consensus [5])
    Note 1: WB forces and muscle actions on bone are important stimulators of bone formation and maintenance of bone mineral density. Altered WB patterns and reflex inhibition of the hip abductors on the involved LE can lead to deficits in bone mineral density at the trochanter (Bailey et al., 1997 [4b]).

    Note 2: Gait compensations can alter loading of the hip joint. A Trendelenburg gait pattern with prolonged hip adduction during stance increases load on the hip joint. An elevation of the pelvis combined with trunk lean towards the stance limb, hip abduction, and hip ER unloads the hip joint (Svehlik et al., 2012 [4b]).

  - Progress gait training without an assistive device as appropriate, focusing on minimizing deficits and improving efficiency of walking (Local Consensus [5])
  - Progress to walking on uneven surfaces with an emphasis on safety (Local Consensus [5])
  - Stair negotiation with a step to pattern and UE support (Local Consensus [5])
  - Use of a heel lift may be utilized, if needed, due to leg length discrepancy to improve quality of gait (Local Consensus [5].

32. It is recommended that activities outside of PT are limited to swimming if the referring physician allows (Local Consensus [5]).
    Note: Running and jumping activities are restricted at this time (Local Consensus [5]).

Pre-Functional Phase (12 weeks to 1+ year post-cast removal)

33. It is recommended that the goals of the Pre-Functional Phase include:
    - Minimize pain
    - Optimize ROM and flexibility of the hip, knee, and ankle
    - Increase strength of the knee and hip, except for hip abductors, to at least 80% of the uninvolved LE
    - Increase strength of the hip abductors to at least 75% of the uninvolved LE due to mechanical disadvantage (Joo et al., 2008 [4b]; Salter, 1984 [5a])
    - Non-painful gait pattern with minimal deficits and normal efficiency
    - Negotiate stairs independently with reciprocal pattern and UE support
    - Improve balance to 80% or greater of the maximum Pediatric Balance Score (at least 45/56) or SL stance of the uninvolved side (Local Consensus [5]).

34. It is recommended that supervised PT services are provided weekly (Bailes, Reder, & Burch, 2008 [5a]) at a frequency of 1 time per week

(Local Consensus [5]) initially and progressed on a periodic or bimonthly basis (Bailes, Reder, & Burch, 2008 [5a]) later at a frequency of 1 to 2 times per month as the family is able to demonstrate independence and self-report compliance with HEP and the patient maintains strength and ROM while waiting to progress to the Functional Phase (Local Consensus [5]).
Note: Sufficient bone healing needs to be determined by the physician before progressing to the Functional Phase (Local Consensus [5]).

35. It is recommended that treatment interventions of the Pre-Functional Phase used to address these specific goals include:
    - Minimizing pain
        - Hot pack for relaxation and pain management with stretching (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a])
        - Cryotherapy (Nadler, Weingand, & Kruse, 2004 [5a])
        - Medications for pain as prescribed by the referring physician (Local Consensus [5])
    - Increasing ROM (See Appendix 1 in the original guideline document for exercise prescription)
        - Static stretch (Moseley et al., 2005 [2a]; Bandy, Irion, & Briggler, 1998 [2a]; Davis et al., 2005 [2b]) for LE musculature focusing on the hamstrings, quadriceps, hip flexors, gastrocnemius, hip adductors, and hip rotators based on remaining limitations (Local Consensus [5])
    - Increasing strength (see Appendix 2 in the original guideline document for exercise prescription)
        - Progress isotonic exercises of the hip, knee, and ankle including concentric and eccentric contractions (Brech & Guarnieiro, 2006 [3b])
        - Use WB and NWB activities in combination based on the patient's ability (Jacobs et al., 2009 [4b]) and goals of the treatment session (Local Consensus [5])
        - Progress functional dynamic SL activities (e.g. step ups, side steps) with UE support only as needed for patient safety (Local Consensus [5])
        - Progress SL closed chain exercises with resistance (Bolgla & Uhl, 2005 [4b])
        - Use of a stationary bike in an upright or recumbent position keeping the hip in less than 90 degrees of flexion (Local Consensus [5])
    - Improving balance
        - DL stance with narrowed base of support on unstable surfaces with perturbations (Local Consensus [5])
        - Static SL stance activities on stable surfaces, progressing to perturbations and unstable surfaces (Local Consensus [5])
    - Improving gait and functional mobility
        - Progress gait training focusing on minimizing deficits and normalizing efficiency without use of an assistive device (Local Consensus [5])
        - Stair negotiation with a reciprocal pattern with UE support (Local Consensus [5]).

36. It is recommended that activities outside of PT include swimming and bike riding as guided by the referring physician (Local Consensus [5]).
    Note: Continue to restrict running and jumping activities (Local Consensus [5]).

Functional Phase

37. It is recommended that progression to the Functional Phase occur when the physician has determined there is sufficient reossification of the femoral head based on radiographs (Local Consensus [5]).
    Note 1: Jumping and other impact activities are still limited and only progressed per instruction from the physician based on healing and progression of the disease process (Local Consensus [5]).

    Note 2: It is appropriate for the patient to transition to Return to Activity Following Lower Extremity Injury Clinical Practice Guideline (Schmitt et al., 2010 [5a]) if the patient meets the following criteria:

    - Has been released by the referring physician
    - Meets the inclusion criteria
    - Plans on returning to sports activity

    (Local Consensus [5]).

38. It is recommended that the goals of the Functional Phase include:
    - Reduce pain to 1/10 or less
    - Increase ROM to 90% or greater of the uninvolved side for the hip, knee, and ankle, except for hip abduction
    - Increase hip abduction ROM to 80% or greater due to potential bony block (Grzegorzewski et al., 2006 [4b])
    - Increase strength of the knee and hip, except for hip abductors, to 90% or greater of the uninvolved LE
    - Increase strength of the hip abductors to at least 85% of the uninvolved LE due to mechanical disadvantage (Joo et al., 2008 [4b];

Salter, 1984 [5a])
- Ambulation with a non-painful limp and normal efficiency
- Negotiation of stairs independently using a reciprocal pattern without UE support
- Improve balance to 90% or greater of the maximum score on the Pediatric Balance Scale (at least 51/56) or SL stance of the uninvolved side

(Local Consensus [5]).

39. It is recommended that supervised PT services are provided on a periodic or bimonthly basis (Bailes, Reder, & Burch, 2008 [5a]) at a frequency of 1 to 2 times per month (Local Consensus [5]).
40. It is recommended that treatment interventions for the Return to Activity Phase for these goals include:
    - Minimizing pain
        - Hot pack for relaxation and pain management with stretching (Taylor, Waring, & Brashear, 1995 [2b]; Nadler, Weingand, & Kruse, 2004 [5a]
        - Cryotherapy (Nadler, Weingand, & Kruse, 2004 [5a])
        - Medications for pain as prescribed by the referring physician as needed (Local Consensus [5])
    - Normalizing ROM (See Appendix 1 in the original guideline document for exercise prescription)
        - Static stretch (Moseley et al., 2005 [2a]; Bandy, Irion, & Briggler, 1998 [2a]; Davis et al., 2005 [2b]) for LE musculature focusing on the hamstrings, quadriceps, hip flexors, gastrocnemius, hip adductors, and hip rotators as needed based on remaining deficits (Local Consensus [5])
    - Normalizing strength (see Appendix 2 in the original guideline document for exercise prescription)
        - Progress isotonic exercises of the hip, knee, and ankle and include concentric and eccentric contractions (Brech & Guarnieiro, 2006 [3b])
        - WB and NWB activities used in combination based on the patient's ability (Jacobs et al., 2009 [4b]) and goals of the treatment session (Local Consensus [5])
        - Functional dynamic SL activities (e.g. step ups, side steps) with UE support as needed for patient safety (Local Consensus [5])
        - Progress SL closed chain exercises with resistance (Bolgla & Uhl, 2005 [4b])
        - Use of a stationary bike in an upright or recumbent position keeping the hip in less than 90 degrees of flexion (Local Consensus [5])
    - Normalizing balance
        - Static SL stance activities on unstable surfaces with perturbations (Local Consensus [5])
        - Progress SL stance with dynamic movements and in multiple planes (Local Consensus [5])
    - Normalizing gait
        - Progress gait training focusing on minimizing deficits and improving efficiency (Local Consensus [5])
        - Progress functional mobility working on age appropriate activities, including running, skipping, and galloping. Focus on safety and minimizing deficits following physician precautions (Local Consensus [5])
        - Stair negotiation with a reciprocal pattern without UE support (Local Consensus [5]).

41. It is recommended that progression of running, jumping, and contact activities be resumed during this phase as guided by the referred physician and determined safe by the physical therapist (Local Consensus [5]).
    Note: Swimming and biking may be continued during this phase (Local Consensus [5]).

Discharge Criteria

42. It is recommended that children be discharged from PT when four of five of the following criteria have been met:
    - Pain rating 0 to 1/10 (Local Consensus [5])
    - ROM 90 to 100% of the uninvolved side except for hip abduction at 80% of the uninvolved side (Local Consensus [5]) due to potential bony block (Grzegorzewski et al., 2006 [4b])
    - Strength 90 to 100% of the uninvolved side (Local Consensus [5]) except for hip abduction at 85% of the uninvolved side due to mechanical disadvantage (Joo et al., 2008 [4b]; Salter, 1984 [5a])
    - Balance 90 to 100% of total score for the Pediatric Balance Scale (score of 51/56) (Franjoine et al., 2010 [4b]) or maintaining balance with SL stance 90 to 100% of the uninvolved side (Local Consensus [5])
    - Gait presents with a non-painful limp when walking and running and uses a reciprocal pattern without UE support on stairs (Local Consensus [5]).

43. It is recommended that following discharge from supervised PT, the patient continue a HEP to maintain improvements in strength, balance,

locomotor function, and pain control until it has been determined by the physician that the disease process is complete (Local Consensus [5]).

44. It is recommended that PT services are provided as needed on a consultative basis (Bailes, Reder, & Burch, 2008 [5a]) to manage flare up of symptoms or other concerns until the disease process has resolved (Local Consensus [5]).

Definitions:

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Local Consensus
5a or 5b	General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

Table of Recommendation Strength

Strength	Definition
"Strongly recommended"	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
"Recommended"	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

Note: See the original guideline document for the dimensions used for judging the strength of the recommendation.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Legg-Calve-Perthes disease (LCP)

Guideline Category

Evaluation

Management

Rehabilitation

Treatment

Clinical Specialty

Family Practice

Internal Medicine

Nursing

Orthopedic Surgery

Pediatrics

Physical Medicine and Rehabilitation

Sports Medicine

Surgery

Intended Users

Advanced Practice Nurses

Nurses

Occupational Therapists

Other

Patients

Physical Therapists

Physician Assistants

Physicians

Guideline Objective(s)

- To guide and support consistency in delivery of physical therapy (PT) services for post-operative management of patients with Legg-Calve-Perthes disease (LCP)
- To promote and optimize range of motion (ROM), strength, and joint preservation to minimize impairments and maximize function
- To maintain and improve patient and family satisfaction

Target Population

Children ages 3 to 12 years old with diagnosis of Legg-Calve-Perthes disease (LCP) stages 1 to 4 status-post surgical intervention

Note: Children with the following conditions are excluded from this guideline:

Conservative management of LCP
Other diagnosis of avascular necrosis in hip
Femoral head injury or fracture
Slipped capital femoral epiphysis
Femur fracture
Acetabular or pelvis fracture
LCP present with other hip condition
Acetabular labral tear
Cancer or bone tumor in femur
Arthritis in hip

Hip dysplasia

Interventions and Practices Considered

Assessment

1. Patient history and physical examination
2. Pain and symptoms (Oucher Pain Scale, Numerical Rating Scale)
3. Qualitative skin integrity assessment
4. Lower extremity passive range of motion (LE PROM), active range of motion (AROM) and active assistive range of motion (AAROM)
5. Lower extremity strength
6. Gait/functional mobility
7. Balance
8. Evaluation for medical equipment, assistive devices
9. Outcome measure scores (age appropriate Pediatric Quality of Life Inventory Version 4.0)

Management/Treatment

1. Establishment of an outpatient impairment based physical therapy (PT) diagnosis and individualized plan of care
2. Pain management (warm whirlpool cryotherapy, hot pack, medications)
3. Improving range of motion (ROM), gentle passive static stretching, gentle PROM, dynamic ROM, perform AROM and AAROM
4. Improving skin integrity (warm whirlpool/bath, scar massage and desensitization)
5. Increasing strength exercises (isometric, isotonic exercises, closed chain double limb [DL] exercises, weight bearing and non-weight bearing activities, stationary bike)
6. Improving gait and functional mobility (transfer training, gait training, assistive devices, stair negotiation, heel lift)
7. Improving balance (DL stance on stable and unstable surfaces, static single limb [SL] stance activities)
8. Restriction of activities outside PT
9. Management of phases of rehabilitation
    - Inpatient management
    - Outpatient management
    - Initial phase (0 to 2 weeks post-cast removal)
    - Intermediate phase (2 to 6 weeks post-cast removal)
    - Advanced phase (6 to 12 weeks post-cast removal)
    - Pre-functional phase (12 weeks to 1+ year post-cast removal)
    - Functional phase
    - Discharge criteria

Major Outcomes Considered

- Patient function including, range of motion (ROM), strength, and joint preservation
- Patient and family satisfaction

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

To select evidence for critical appraisal by the group for this guideline, the Medline, Embase and the Cochrane databases were searched for dates of January 1970 to October 2012 to generate an unrefined, "combined evidence" database using a search strategy focused on answering clinical

questions relevant to post-operative management of Legg-Calve-Perthes Disease and employing a combination of Boolean, searching on human-indexed thesaurus terms (MeSH headings using an OVID Medline interface) and "natural language" searching on Legg-Calve-Perthes, range of motion, strength, balance, gait, physical therapy, post-operative treatment, and surgical procedures in the title, abstract, and indexing terms.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5	Local Consensus
5a or 5b	General review, expert opinion, case report, consensus report, or guideline

†a = good quality study; b = lesser quality study

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The citations were reduced by: eliminating duplicates, review articles, non-English articles, and adult articles. The resulting abstracts were reviewed by team members to eliminate low quality and irrelevant citations. During the course of the guideline development, additional clinical questions were generated and subjected to the search process, and some relevant review articles were identified.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

The recommendations contained in this guideline were formulated by an interdisciplinary working group which performed systematic search and critical appraisal of the literature, using the Table of Evidence Levels described in the "Rating Scheme for the Strength of the Evidence" field, and examined current local clinical practices.

Recommendations have been formulated by a consensus process directed by best evidence, patient and family preference and clinical expertise. During formulation of these recommendations, the team members have remained cognizant of controversies and disagreements over the

management of these patients. They have tried to resolve controversial issues by consensus where possible and, when not possible, to offer optional approaches to care in the form of information that includes best supporting evidence of efficacy for alternative choices.

Rating Scheme for the Strength of the Recommendations

Table of Recommendation Strength

Strength	Definition
"Strongly recommended"	There is consensus that benefits clearly outweigh risks and burdens (or visa-versa for negative recommendations).
"Recommended"	There is consensus that benefits are closely balanced with risks and burdens.
No recommendation made	There is lack of consensus to direct development of a recommendation.

Note: See the original guideline document for the dimensions used for judging the strength of the recommendation.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

The guideline has been reviewed and approved by clinical experts not involved in the development process, distributed to senior management, and other parties as appropriate to their intended purposes.

Evidence Supporting the Recommendations

References Supporting the Recommendations

APTA: who are physical therapists, and what do they do?. In: Association A PT, editor(s). Guide to physical therapy practice. Alexandria (VA): APTA; 2001.

Bailes AF, Reder R, Burch C. Development of guidelines for determining frequency of therapy services in a pediatric medical setting. Pediatr Phys Ther. 2008;20(2):194-8. PubMed

Bailey DA, Faulkner RA, Kimber K, Dzus A, Yong-Hing K. Altered loading patterns and femoral bone mineral density in children with unilateral Legg-Calve-Perthes disease. Med Sci Sports Exerc. 1997 Nov;29(11):1395-9. PubMed

Bandy WD, Irion JM, Briggler M. The effect of static stretch and dynamic range of motion training on the flexibility of the hamstring muscles. J Orthop Sports Phys Ther. 1998 Apr;27(4):295-300. PubMed

Beyer JE, Turner SB, Jones L, Young L, Onikul R, Bohaty B. The alternate forms reliability of the Oucher pain scale. Pain Manag Nurs. 2005 Mar;6(1):10-7. PubMed

Bolgla LA, Uhl TL. Electromyographic analysis of hip rehabilitation exercises in a group of healthy subjects. J Orthop Sports Phys Ther. 2005 Aug;35(8):487-94. PubMed

Brech GC, Guarnieiro R. Evaluation of physiotherapy in the treatment of Legg-Calve-Perthes disease. Clinics (Sao Paulo). 2006 Dec;61(6):521-8. PubMed

Clapper MP, Wolf SL. Comparison of the reliability of the Orthoranger and the standard goniometer for assessing active lower extremity range of motion. Phys Ther. 1988 Feb;68(2):214-8. PubMed

Davis DS, Ashby PE, McCale KL, McQuain JA, Wine JM. The effectiveness of 3 stretching techniques on hamstring flexibility using consistent stretching parameters. J Strength Cond Res. 2005 Feb;19(1):27-32. PubMed

Depino GM, Webright WG, Arnold BL. Duration of maintained hamstring flexibility after cessation of an acute static stretching protocol. J Athl Train. 2000 Jan;35(1):56-9. PubMed

Escolar DM, Henricson EK, Mayhew J, Florence J, Leshner R, Patel KM, Clemens PR. Clinical evaluator reliability for quantitative and manual muscle testing measures of strength in children. Muscle Nerve. 2001 Jun;24(6):787-93. PubMed

Faigenbaum AD, Westcott WL, Micheli LJ, Outerbridge AR, Long CJ, LaRosa-Loud R, Zaichkowsky LD. The effects of strength training and detraining on children. J Strength Cond Res. 1996;10(2):110-14.

Franjoine MR, Darr N, Held SL, Kott K, Young BL. The performance of children developing typically on the pediatric balance scale. Pediatr Phys Ther. 2010 Winter;22(4):350-9. PubMed

Friedrich M, Cermak T, Maderbacher P. The effect of brochure use versus therapist teaching on patients performing therapeutic exercise and on changes in impairment status. Phys Ther. 1996 Oct;76(10):1082-8. PubMed

Gajdosik CG. Ability of very young children to produce reliable isometric force measurements. Pediatr Phys Ther. 2005 Winter;17(4):251-7. PubMed

Grzegorzewski A, Synder M, Kozlowski P, Szymczak W, Bowen RJ. The role of the acetabulum in Perthes disease. J Pediatr Orthop. 2006 May-Jun;26(3):316-21. PubMed

Harrison RA, Hillman M, Bulstrode S. Loading of the lower limb when walking partially immersed: implications for clinical practice. Physiotherapy. 1992;78(3):164-6.

Jacobs CA, Lewis M, Bolgla LA, Christensen CP, Nitz AJ, Uhl TL. Electromyographic analysis of hip abductor exercises performed by a sample of total hip arthroplasty patients. J Arthroplasty. 2009 Oct;24(7):1130-6. PubMed

Joo SY, Lee KS, Koh IH, Park HW, Kim HW. Trochanteric advancement in patients with Legg-Calve-Perthes disease does not improve pain or limp. Clin Orthop Relat Res. 2008 Apr;466(4):927-34. PubMed

Leach J. Orthopedic conditions. In: Campbell S, Palisano R, Vander Linden D, editor(s). Physical therapy for children. Saunders; 2006. p. 498-9.

Moseley AM, Herbert RD, Nightingale EJ, Taylor DA, Evans TM, Robertson GJ, Gupta SK, Penn J. Passive stretching does not enhance outcomes in patients with plantarflexion contracture after cast immobilization for ankle fracture: a randomized controlled trial. Arch Phys Med Rehabil. 2005 Jun;86(6):1118-26. PubMed

Nadler SF, Weingand K, Kruse RJ. The physiologic basis and clinical applications of cryotherapy and thermotherapy for the pain practitioner. Pain Physician. 2004 Jul;7(3):395-9. PubMed

Rao KN, Joseph B. Value of measurement of hip movements in childhood hip disorders. J Pediatr Orthop. 2001 Jul-Aug;21(4):495-501. PubMed

Rhea MR, Alvar BA, Ball SD, Burkett LN. Three sets of weight training superior to 1 set with equal intensity for eliciting strength. J Strength Cond Res. 2002 Nov;16(4):525-9. PubMed

Roesler H, Haupenthal A, Schutz GR, de Souza PV. Dynamometric analysis of the maximum force applied in aquatic human gait at 1.3m of immersion. Gait Posture. 2006 Dec;24(4):412-7. PubMed

Salter RB. The present status of surgical treatment for Legg-Perthes disease. J Bone Joint Surg Am. 1984 Jul;66(6):961-6. PubMed

Schmitt L, Byrnes R, Cherny C, Filipa A, Harrison A, Paterno M, Smith T. Evidence-based clinical care guideline for return to activity after lower extremity injury. Cincinnati (OH): Cincinnati Children's Hospital; 2010. 13 p.

Sluijs EM, Kok GJ, van der Zee J. Correlates of exercise compliance in physical therapy. Phys Ther. 1993 Nov;73(11):771-82; discussion 783-6. PubMed

Svehlik M, Kraus T, Steinwender G, Zwick EB, Linhart WE. Pathological gait in children with Legg-Calve-Perthes disease and proposal for gait modification to decrease the hip joint loading. Int Orthop. 2012 Jun;36(6):1235-41. PubMed

Taylor BF, Waring CA, Brashear TA. The effects of therapeutic application of heat or cold followed by static stretch on hamstring muscle length. J Orthop Sports Phys Ther. 1995 May;21(5):283-6. PubMed

Toro B, Nester CJ, Farren PC. A review of observational gait assessment in clinical practice. Physiother Theory Pract. 2003;19:137-49.

Varni JW, Limbers CA, Burwinkle TM. How young can children reliably and validly self-report their health-related quality of life?: an analysis of 8,591 children across age subgroups with the PedsQL 4.0 Generic Core Scales. Health Qual Life Outcomes. 2007;5:1. PubMed

Varni JW, Limbers CA, Burwinkle TM. Parent proxy-report of their children's health-related quality of life: an analysis of 13,878 parents' reliability and validity across age subgroups using the PedsQL 4.0 Generic Core Scales. Health Qual Life Outcomes. 2007;5:2. PubMed

Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. Med Care. 2001 Aug;39(8):800-12. PubMed

von Baeyer CL, Spagrud LJ, McCormick JC, Choo E, Neville K, Connelly MA. Three new datasets supporting use of the Numerical Rating Scale (NRS-11) for children's self-reports of pain intensity. Pain. 2009 Jun;143(3):223-7. PubMed

Wenger DR, Ward WT, Herring JA. Legg-Calve-Perthes disease. J Bone Joint Surg Am. 1991 Jun;73(5):778-88. [98 references] PubMed

Westhoff B, Martiny F, Reith A, Willers R, Krauspe R. Computerized gait analysis in Legg-Calve-Perthes disease--analysis of the sagittal plane. Gait Posture. 2012 Apr;35(4):541-6. PubMed

Westhoff B, Petermann A, Hirsch MA, Willers R, Krauspe R. Computerized gait analysis in Legg Calve Perthes disease--analysis of the frontal plane. Gait Posture. 2006 Oct;24(2):196-202. PubMed

Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. J Clin Nurs. 2005 Aug;14(7):798-804. PubMed

Wong J, Boyd R, Keenan NW, Baker R, Selber P, Wright JG, Nattrass GR, Graham HK. Gait patterns after fracture of the femoral shaft in children, managed by external fixation or early hip spica cast. J Pediatr Orthop. 2004 Sep-Oct;24(5):463-71. PubMed

Yoo WJ, Choi IH, Cho TJ, Chung CY, Park MS, Lee DY. Out-toeing and in-toeing in patients with Perthes disease: role of the femoral hump. J Pediatr Orthop. 2008 Oct-Nov;28(7):717-22. PubMed

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- The desired outcome of treatment of children with Legg-Calve-Perthes disease (LCP) is to contain the femoral head in the acetabulum to maximize a spherical shape of the femoral head for good joint congruency
- Consistency in delivery of physical therapy (PT) services for post-operative management of patients with LCP to promote and optimize range of motion (ROM), strength, and joint preservation, minimize impairments, maximize function and improve patient and family satisfaction

Potential Harms

Not stated

Qualifying Statements

Qualifying Statements

These recommendations result from review of literature and practices current at the time of their formulations. This guideline does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this guideline is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Implementation of the Guideline

Description of Implementation Strategy

Tools to assist in the effective dissemination and implementation of the guideline may be available online at http://www.cincinnatichildrens.org/svc/alpha/h/health-policy/ev-based/default.htm.

Implementation Tools

Chart Documentation/Checklists/Forms

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Cincinnati Children's Hospital Medical Center. Evidence-based care guideline for post-operative management of Legg-Calve-Perthes disease in children aged 3 to 12 years. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2013 Jan. 18 p. [59 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2013 Jan

Guideline Developer(s)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

Source(s) of Funding

Cincinnati Children's Hospital Medical Center

Guideline Committee

Division of Occupational Therapy and Physical Therapy Guideline Development Team

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Financial Disclosures/Conflicts of Interest

All Team Members listed have declared whether they have any conflict of interest and none were identified.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the Cincinnati Children's Hospital Medical Center Web site .

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center Health James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

Availability of Companion Documents

The following are available:

- Evidence-based care guideline development and update process. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2006 Mar. 35 p. Available from the Cincinnati Children's Hospital Medical Center Web site .
- Judging the strength of a recommendation. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2008 Jan. 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site .
- Grading a body of evidence to answer a clinical question. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 1 p. Available from the Cincinnati Children's Hospital Medical Center Web site.
- Table of evidence levels. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2008 Feb 29. 1 p. Available from the Cincinnati Children's Hospital Medical Center .

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center Health James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

Also, the appendices of the original guideline document contains a chart with prescriptions for range of motion (ROM) and strengthening exercises.

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on April 12, 2013.

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